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SEEDS OF FLOWERING PLANTS.

Studies in Seeds and Fruits: an Investigation with the Balance. By H. B. Guppy. Pp. xii + 528. (London: Williams and Norgate, 1912.) Price 15*s.* net.

IN this work we find the results of Mr. Guppy's investigations on the seeds of several flowering plants. The investigations seem to have been prompted by a statement by Goebel to the effect that the biology of the ripening fruit has hitherto scarcely received attention, and a further statement by Pfeffer that the means by which the power of resistance to drying is gained and the changes which cause its loss are quite unknown.

Such subjects are investigated as the permeability and impermeability of seeds, their hygroscopicity, shrinking and swelling, their homologies, their dehiscence, the proportions of the different parts of the fruits, the relation between the number of seeds and the size and weight of the fruit, the abortion of ovules and the failure of seeds, seed coloration, the weight of the embryo, the rest period of seeds, and finally "the cosmic adaptation of the seed." It is impossible in the space of a short review to give any adequate ideas of the whole of the author's investigations.

From the beginning his "usual plan of following indications was adopted, forming crude hypotheses as [he] went along, and dropping them as soon as they had lost their usefulness. Many points, of course, remained undetermined," and Mr. Guppy only offers "a contribution to the study of a difficult but highly interesting subject." In the cases investigated it was found that all the ovules begin to respond to fertilisation; but it frequently happened, as in Arenaria, Stellaria, Primula, Scilla, and Iris, that only two-thirds of the original complement of ovules developed into mature seeds. In several legumes a marked constriction results from the abortion of the ovules, the degree of constriction being determined by the number of contiguous failures.

Special stress is laid on seedless fruits, where the fruit develops under the stimulus of pollination but the seeds fail. The author's results, so far as they go, are full of interest, and he fully realises that much more must be determined before it is possible to draw safe generalisations. To some readers the book will appear discursive and perhaps unconvincing, and without doubt the salient features of the work could have been expressed in fewer words; but throughout the book one sees the unprejudiced observer at work, and many of the results obtained are both interesting and important. Its very discursiveness has a kind of charm, and there is an occasional incisiveness which is refreshing, as in the following:—

"Lord Avebury would regard such persistently functionless ovules as carrying us back to the time when . . . all the ovules developed into seeds. Prof. Bower holds a similar view with reference to the abortive ovules in the beak of a fruit of *Anemone nemorosa*. . . It should, however, be pointed out that this would not follow if we accept the standpoint taken by Dr. Goebel . . . that functionless organs in plants are not necessarily the vestiges of former completely developed ones, and that many more primordia are laid down than become functional."

Each chapter is supplied with a full and useful summary, and there is an excellent index. It is refreshing to find that Mr. Guppy is not content with vaguely referring to authorities, but supplies the name of the work and the volume and the page of the authors he refers to. In this last respect, as well as in some others, his methods are worthy of being adopted by more pretentious writers.

ENGINEERING SCIENCE.

Mécanique Appliquée. By Prof. John Perry. Ouvrage traduit sur la Neuvième Edition Anglaise par E. Davaux. Avec des additions et un appendice sur la mécanique des corps déformables by E. Cosserat and F. Cosserat. Tome Premier. L'Energie Mécanique. Pp. vii + 398. (Paris: A. Hermann et Fils, 1913.)

THERE must surely be few text-books about which such conflicting opinions are held as this well-known book on applied mechanics by Prof. John Perry. One of these opinions, favourable to the book, is held by a majority of teachers of engineering science and by almost all engineers. The other, which is equally unfavourable, is confined to a minority of teachers—doubtless the "academic persons" to whom the author so often refers. There must be something fundamental, some conflict of principle, which can produce so wide a difference of opinion between persons equally competent to judge. We are aided in arriving at the nature of this conflict by the fact that engineers outside the colleges are almost universally in its favour; as they are, indeed, of each of the author's text-books relating to engineering subjects. Perhaps a parable may be admitted. We picture two travellers desirous of arriving at the same destination, one of them alert to have all the precise formalities of the journey carefully observed, and the other careless of by-laws, and only careful that he shall arrive at his destination by a road which, while reasonably

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rapid, shall not absorb his every mental activity until such time as the destination is reached.

Put crudely, it is the old choice between devotion to the "means" and devotion to the "ends." Engineers almost always care more for the latter than for the former, being well aware that their route must ever be subject to other than purely abstract considerations. Unless engineering "instinct" points along some reasonably converging line, nothing will persuade them that the "academic" path is the true one. But this is stated as the point of view of English engineers. How does the matter stand with, let us say, the German and the French? This question is to some extent answered by the interesting fact that, although a German edition of Perry's "Applied Mechanics" was published five years ago, it is only in 1913 that a French translation is appearing.

For this purpose the book has been divided into two volumes, of which the first has now been published with a preface by MM. E. and F. Cosserat. After describing generally the method of the book, the writers of the preface remark: "C'est cette méthode, quelque peu hérétique dans notre pays, qui a été dévelopée avec un très grand talent par M. John Perry dans le livre remarquable que nous présentons aux lecteurs français."

The French mind is logical and is attracted by logical method; their engineering is a far more highly refined product than the English—judged, that is, from the scientific point of view. The Germans are capable of as much precision as the French, but are more desirous of taking high place as capable technicians, and inclined, therefore, to study the methods which successful English engineers have adopted. How successful that study has been there are many instances to show. It has occasionally happened, indeed, that German method has far outreached the English, so that the less sturdy opinion in this country has felt there is cause for pessimism, notwithstanding that such industries are rarely the most productive of income, or the least risky in respect of capital.

Germany is willing to learn from England because she values the "fait accompli." France, looking more to abstract considerations, does not think she has much to learn from English writers, and refrains, therefore, from a zealous study of them. If we take, for example, one of the problems dealt with in this book—that of the proper design of springs—we find English engineers relying chiefly on rule-of-thumb methods, whilst the most carefully refined analysis of the subject appeared in French many years ago. Why, therefore, should the French look to us for guidance? Furthermore, it often happens that English writings on the scientific study of engineering work are unknown abroad. A Swedish engineer recently explained to the writer that, in consequence of the different way in which the bookselling business is managed abroad, English technical books are sold to a very small extent, and that ninety-nine out of a hundred foreigners get the impression that by far the greater progress in science and theoretical engineering comes from Germany. The translation of Prof. Perry's book into French will help to eradicate this impression, and we congratulate ourselves, as well as Prof. Perry, upon this sign of appreciation of English engineering science.

H. E. W.

PALÆOLITHIC MAN AND BRONZE AGE MAN.

Palaeolithic Man and Terramara Settlements in Europe. By Dr. Robert Munro. Pp. xxiii + 507 + 74 plates. (Edinburgh: Oliver and Boyd; London: Gurney and Jackson, 1912.) Price 16*s.* net.

LAST year Dr. Robert Munro founded a lectureship in the University of Edinburgh to popularise the results of research in anthropology and prehistoric archæology, which have recently become so important and interesting. He himself gave the inaugural course, and these lectures have now been published in a copiously illustrated volume, which will be welcomed equally by the general reader and the student. In the first part Dr. Munro summarises our present knowledge of Palæolithic man in Europe, while in the second part he gives a more detailed account of the Terramara settlements of the Po valley in northern Italy, to which he himself has paid special attention. In all cases the readable text is accompanied by ample references to the literature of the subject.

Dr. Munro does well at the outset to emphasise the fact "that the principles and laws which govern the rest of the organic world, past and present, are equally applicable to Man," and he thus begins with an interesting sketch of organic evolution. He points out that man's career was an entirely new departure owing to his superior mental endowments, and he argues that this superiority was primarily due to the attainment of the erect attitude. There are, however, still many difficulties in accepting the latter opinion, and more facts are needed before it can be satisfactorily discussed.

In the admirable review of the discoveries of Palæolithic man and his handiwork, Dr. Munro makes several interesting suggestions, and formulates judgments on some of the subjects of controversy. He accepts the French classification of

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